

Docket Number: 45,605
U.S. Serial Number: 08/468,649

43. (Amended) [The liquid crystal display device of claim 4] A liquid crystal display comprising:

a liquid crystal display main body comprising a plurality of liquid crystal panels ~~non-electrically~~ connected to each other adjacently on a single surface, each liquid crystal panel including a respective pixel electrode;

a first photo-blocking film which covers a circumference of each pixel electrode in a predetermined trace width; and

a third photo-blocking film provided in connected parts of said plurality of liquid crystal panels to fill spaces of said connected parts wherein said third photo-blocking film is made of an elastic photo-absorbing material.

REMARKS

In the Official Action dated March 22, 1996, the Examiner objected to Figures 15-18 as not being designated by a legend such as "Prior Art." Substitute Figures 15-18 are submitted herewith having changes in red for the Examiner's approval.

Docket Number: 45,605
U.S. Serial Number: 08/468,649

The Examiner also objected to the title and suggested a new title. The Title is amended herewith to be more clearly indicative of the invention to which the claims are directed.

The Examiner objected to the Specification under 35 U.S.C. §112, first paragraph, as failing to adequately teach how to make and/or use the invention, i.e., failing to provide an enabling disclosure. The Examiner apparently objected to the use of the term "crossed nichol state" to refer to the relationship between first and second deflecting plates (8) (e.g. at page 9, lines 4-5, page 21, line 16, etc.)

The phrase "the crossed nicols state" of the first and second deflecting elements as used in the present Specification is used to describe the state of a pair of polarizers or deflecting elements (e.g., reference numeral 8 in Fig. 1), which are placed in such a manner that their polarizing axes will cross at right angles with each other. The term "crossed nicol state" is generally understood by those skilled in the art to have such meaning. The phrase is not used to specify components called "crossed nicol polarizer" or "cross nichol deflecting plate", but to indicate the configuration of a pair of polarizers or deflecting elements. Accordingly, the meaning of such terminology is clear and the rejection under 35 U.S.C. §112, first paragraph, should be withdrawn.

Docket Number: 45,605
U.S. Serial Number: 08/468,649

Furthermore, the Examiner raised questions about the photo-blocking layer, asserting that a layer of $10^{-20}\mu\text{m}$ thickness was somehow required to be disclosed. However, the Specification does not contain any description about the layer of that specific thickness. Thus, it is presumed that the Examiner is referring to the description on page 37, lines 17-19 of the Specification, describing that "The metal film 42, ..., can make the black matrix 5 of $0.5\mu\text{m}$ or less in thickness." Presumably, the Examiner is questioning whether a thickness of the photo-blocking layer has a lower limit or not. In practical terms, and as understood by those skilled in the art, the photo blocking layer should have a thickness of $0.1\mu\text{m}$ or more, because a photo-blocking layer of less than $0.1\mu\text{m}$ thick transmits light, and therefore, it can no longer serve as the photo-blocking layer. A photo-blocking layer of $0.1 - 0.5\mu\text{m}$ thick can be readily produced through sputtering as understood in the art.

For purposes of responding to such rejection, it is presumed that the Examiner is asking, with reference to the description on page 19, lines 22-25, "When the width b of the space is narrower than the trace width of a black matrix 5...", how one can form the third photo-blocking layer in a space when its width b is zero. One skilled in the art will clearly appreciate that a layer with zero thickness can not be formed, and that the referenced description is incorporated in the Specification to stress that it is important to satisfy the relationship $a > b$. Clearly, as one skilled in the art will appreciate, such description is intended

Docket Number: 45,605
U.S. Serial Number: 08/468,649

to imply that a layer having no thickness could or should be formed. If the foregoing discussion is not sufficient to overcome the rejection under 35 U.S.C. §112, first paragraph, Applicants respectfully request that the Examiner clarify such rejection and make reference to specific portions of the Specification that are not enabling to one skilled in the art.

The Examiner rejected claims 10-13, 18 and 23 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner questioned whether the term "an active element in matrix" was a plurality or a single active element. The language of the claims clearly indicates that "an" active element is claimed, which indicates the singular; however, if plural elements are present, the claim covers such a case because at least one is present. Applicants respectfully submit that such rejection should be withdrawn.

In the Official Action, the Examiner rejected claims 1-4, 10-12, 14-16, 18-21, 23, 30-42, 44 and 47 under 35 U.S.C. §103 as being unpatentable over Kikuno, U.S. Patent No. 4,408,836.

The cited Kikuno reference (U.S. Patent No. 4,408,836), discloses a liquid crystal display device comprising a plurality of liquid crystal display cells electrically interconnected through connectors made of

Docket Number: 45,605
U.S. Serial Number: 08/468,649

electrically conductive rubber or the like. To hide the connectors, the cited reference discloses an arrangement that a thin film 23 (in case of the positive type) or black coating (in the case of the negative type) is formed over the joints in the space between the polarizer and liquid crystal cell. Forming the thin film or black coating on the above-specified place can hide the joints only when one sees the screen directly from above the polarizer, and if one sees the screen diagonally, the thin film (black coating) casts a shadow on the display section, thereby making a displayed image unnatural.

In contrast, the liquid crystal cells of the present invention are not electrically interconnected. Thus, there is no need to hide the connectors with the thin film (black coating) like the cited Kikuno reference. Thus, the structure is simplified and a displayed image is natural to the viewers even when seen from a diagonal. This feature is unique to the present invention and is neither disclosed nor suggested in the Kikuno reference. In view of the foregoing, Applicants respectfully submit that the present inventions as defined in claims 1-4, 10-12, 14-16, 18-21 23, 30-42, 44 and 47 are patentably distinguishable over the cited Kikuno reference.

The Examiner rejected claims 7-9, 13, 17, 22, 24-29 under 35 U.S.C. §103 as being unpatentable over Ohuchida, U.S. Patent No. 5,106,197 in view of Kikuno.

Docket Number: 45,605
U.S. Serial Number: 08/468,649

The cited Ohuchida reference discloses an arrangement wherein a plurality of liquid crystal panels are electrically interconnected through electrodes and are assembled into a single wide-screen liquid crystal display panel, which makes the joints noticeable. Yet, the cited reference does not teach any means to hide the joints. Moreover, using cross nicol configured polarizers can not hide the electrodes electrically interconnecting the liquid crystal panels. Thus, the liquid crystal display apparatus of the cited Ohuchida reference can not display a natural image on the screen as does the present invention.

In addition, the cited Ohuchida reference neither discloses nor suggests any component corresponding to the refraction factor adjusting member of the present invention that has substantially the same refraction factor of the panel substrate forming the liquid crystal panel, such as Applicants particularly claim. Thus, one skilled in the art could not have achieved the present invention as defined in claims 7-9, 13, 17, 22, 24 through 29 by simply combining the Ohuchido and Kikuno references at the time the invention was made.

In both the cited references, a plurality of liquid crystal cells are electrically connected to be assembled in a single wide-screen liquid crystal display panel. Therefore, joints of a certain width are inevitable, and it is by no means easy to hide such joints. Nor does either of the references suggest the structure disclosed and claimed by the Applicants.

Docket Number: 45,605
U.S. Serial Number: 08/468,649

In contrast to the cited references, in the present invention a plurality of liquid crystal cells are not electrically connected. This arrangement allows the shortest possible space between the substrates. In addition, should there be a substantial space between the substrates, a pair of cross nicol configured polarizers (two deflecting plates 8) can make the space less noticeable even when one sees the screen diagonally.

As has been explained in the present Specification, it is conventional that the photo-blocking films or the like are interposed between the substrates when a plurality of liquid crystal cells are laminated to each other. However, in the present invention, no component is interposed between the substrates and if there is a substantial space between the substrates, the cross nicol configured polarizers make the same less noticeable. This arrangement of the present invention allows the shortest possible space between the substrates and makes the joints less noticeable on a display image even if one sees the screen diagonally.

Claims 6, 43 and 45-46 were objected to by the Examiner as being dependent upon a rejected base claim, but were indicated as allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 6 and 43 are amended herewith to include all features of their respective base claims. Thus, those claims and any claims depended thereon should be allowed.

Docket Number: 45,605
U.S. Serial Number: 08/468,649

By the amendments and remarks herein, Applicants believe that the present application is in condition for allowance. Therefore, reconsideration and allowance is respectfully requested.

The Examiner is invited and encouraged to telephone the undersigned with any concerns in furtherance of the prosecution of the present application.

Respectfully submitted,

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FIG. 16 (Prior Art)

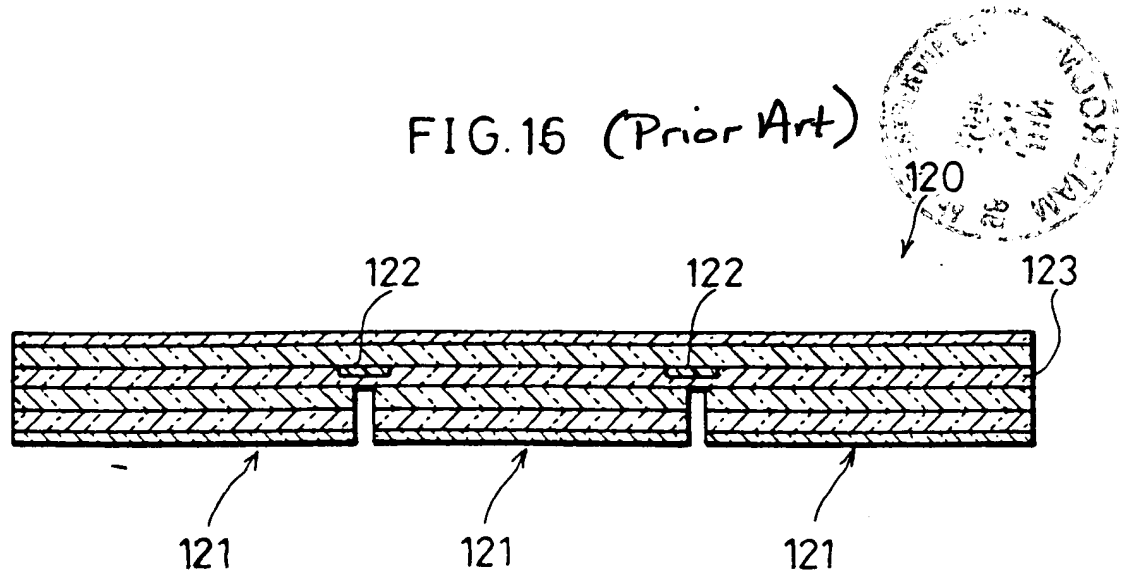


FIG. 17 (Prior Art)

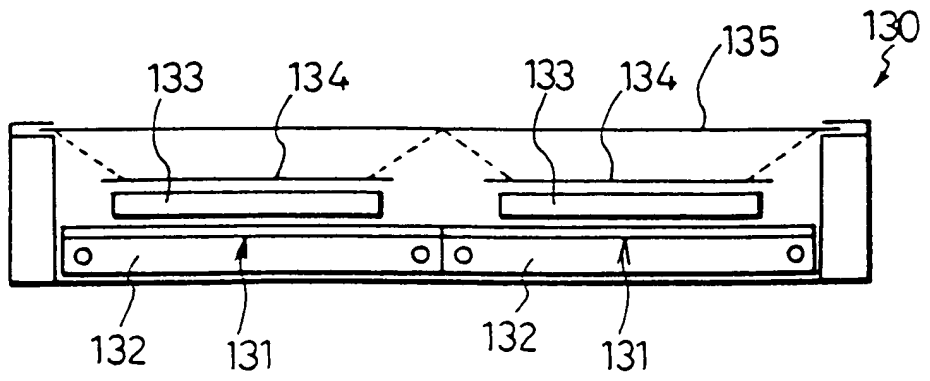


FIG. 15 (Prior Art)

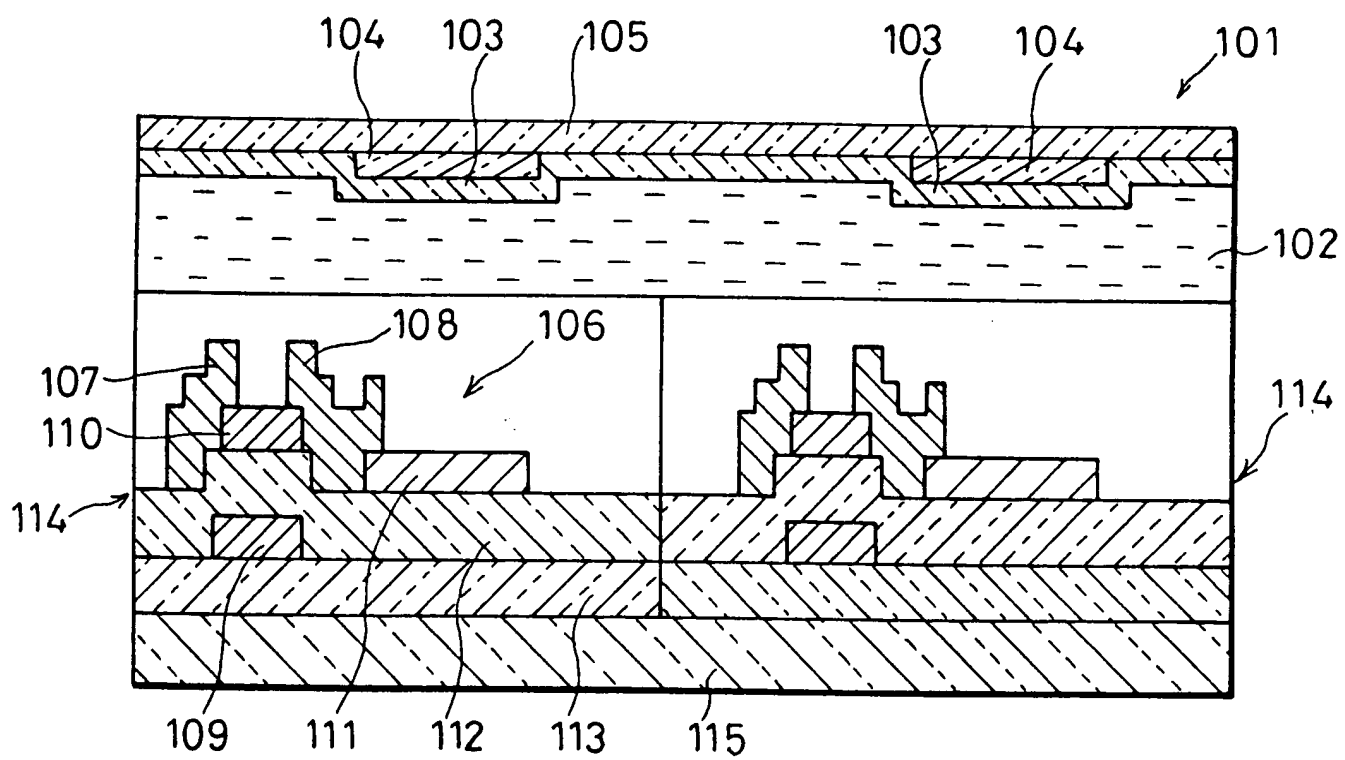


FIG. 18 (Prior Art)

